Atlantic Oceanographic and Meteorological Laboratory

Update on the Observing System Simulation Experiment (OSSE) Testbed

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In collaboration with ESRL, NSSL, JCSDA

Primary Objective

To establish a numerical test bed that would enable a hierarchy of experiments to:

(1)determine the potential impact of proposed space-based, sub-orbital, and in situ observing systems on analyses and forecasts,

(2)evaluate trade-offs in observing system design, and

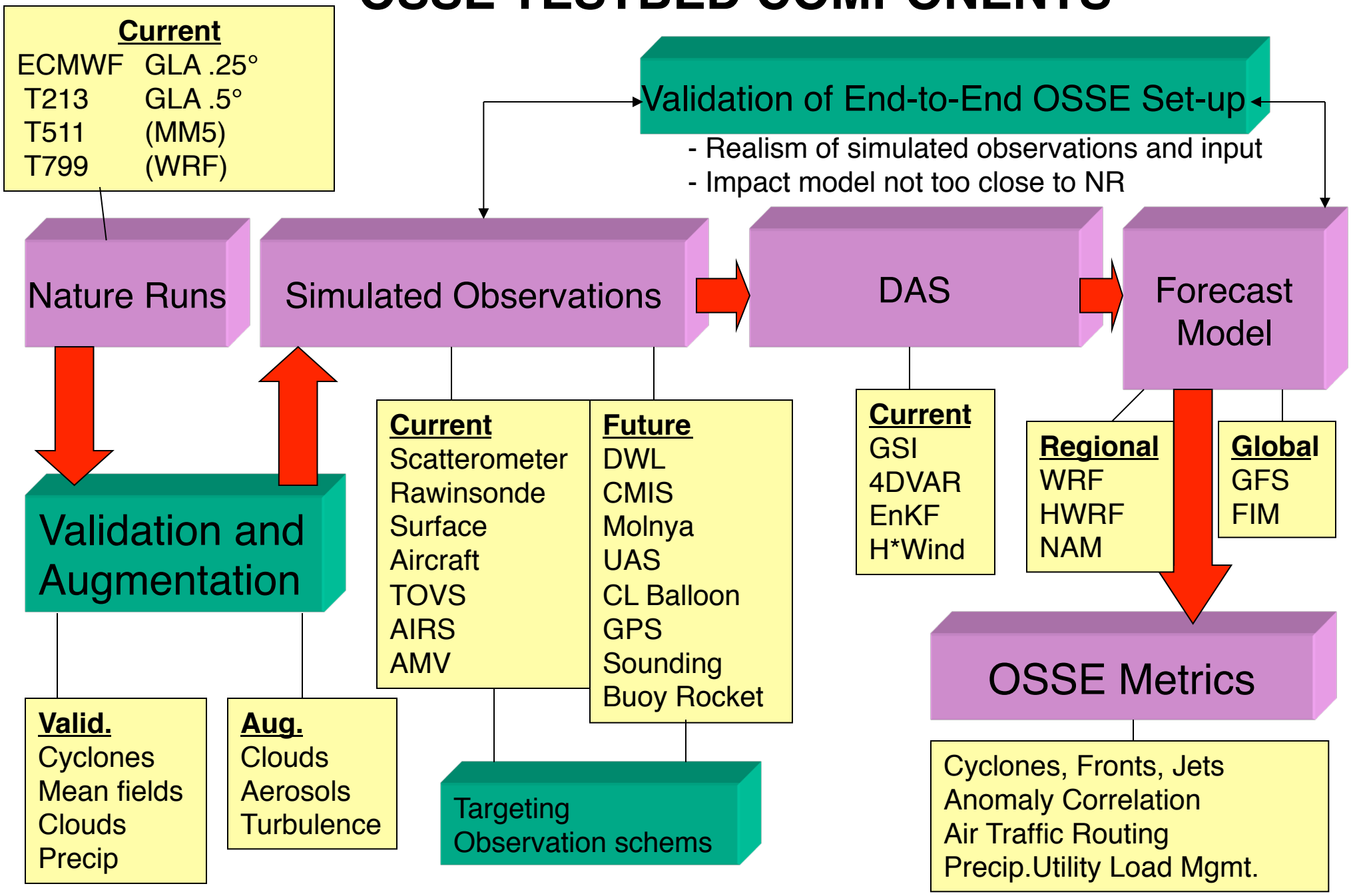
(3)assess proposed methodology for assimilating new observations in coordination with the Joint Center for Satellite Data Assimilation (JCSDA).

Sub-objectives

(1)To define both the advantages and limitations of a hierarchy of OSSEs that includes rapid prototyping of instrument or data assimilation concepts, as well as the more rigorous “full” OSSEs.

(2) To generate an OSSE/OSE process that invites participation by the broad community of agency planners, research scientists and operational centers.

OSSE TESTBED COMPONENTS



Accomplishments

1. Provided expertise on OSSEs to NOAA, partners and academia.

2. Generated a regional Hurricane OSSE system with multiple 1 km resolution nature runs embedded in the ECMWF T511 global nature run, and with multiple options for data assimilation. (AOML and RSMAS)

3. Completed the first phase of a global OSSE for UAS and completed a report and one refereed article from this OSSE. (ESRL, AOML and RSMAS)

4. Completed the first phase of a global OSSE for WISDOM balloons.(ESRL, AOML)

5. Completed a global OSSE for DOD to evaluate alternatives for the DWSS early morning orbit. (JCSDA and AOML)

6. Completed OSSEs to evaluate alternatives for space-based lidar winds for NASA. (AOML, SWA, BATC, JCSDA, and NASA GSFC)

Accomplishments

7. Began OSSEs to evaluate advanced hyperspectral sounders, geostationary microwave sounders, and multiple GNSS RO concepts. (AOML,NESDIS STAR, CIMSS, JCSDA, JPL, GSFC, EMC)

8. Developed the first ever rigorously validated ocean OSSE system anywhere in the world. Initial ocean OSEs and OSSEs relating to hurricane prediction have been performed. Others are continuing. . (AOML and RSMAS)

9. Conducted an OSE at the request of IOOS and the NOSC to evaluate the value of CMAN coastal buoys on hurricane surface wind analyses. . (AOML)

10. Began development of a next generation global OSSE system.

11. Presented results at AMS Annual Meeting, AMS Hurricane Conference, AGU Fall Meeting, and two International Remote Sensing Conferences.

Current and future work

1. Complete the current global and regional OSSEs related to wind lidar, hyperspectral sounders, GeoStorm, UAS, and GNSS RO.

2. Begin new OSSEs to evaluate mitgation strategies for the potential polar orbiting satellite data gap.

3. Investigate targeting observation schemes for UAS and aircraft.

4. Expand regional OSSEs for severe local storm and air quality forecasting.

5. Complete the development of next generation global OSSE system.

Description of Global OSSE to evaluate alternative lidar technologies

NATURE RUN:

ECMWF T511 Nature run for the period from May 10 2005 to May 31, 2006.

GLOBAL DATA ASSIMILATION SYSTEM USED:

NCEP GFS at T382 resolution

PERIOD OF ASSIMILATION: July 28 – August 24, 2005

DATA ASSIMILATION EXPERIMENTS:

CTRL (All standard conventional and space-based data)

OAWL (CTRL+OAWL lidar wind data)

WISSCRCOH (Conventional Data +WISCRCOH coherent lidar wind data)

FORECAST EXPERIMENTS: Twenty 7-day forecasts generated from each

Description of Regional OSSE

NATURE RUN:

WRF ARW embedded within the ECMWF T511 Global Nature run for the period from July 28 to August 10, 2005.

REGIONAL DATA ASSIMILATION SYSTEM USED:

Current operational version of HWRF with GSI

PERIOD OF ASSIMILATION: August 4, 00-18Z, 2005

DATA ASSIMILATION EXPERIMENTS:

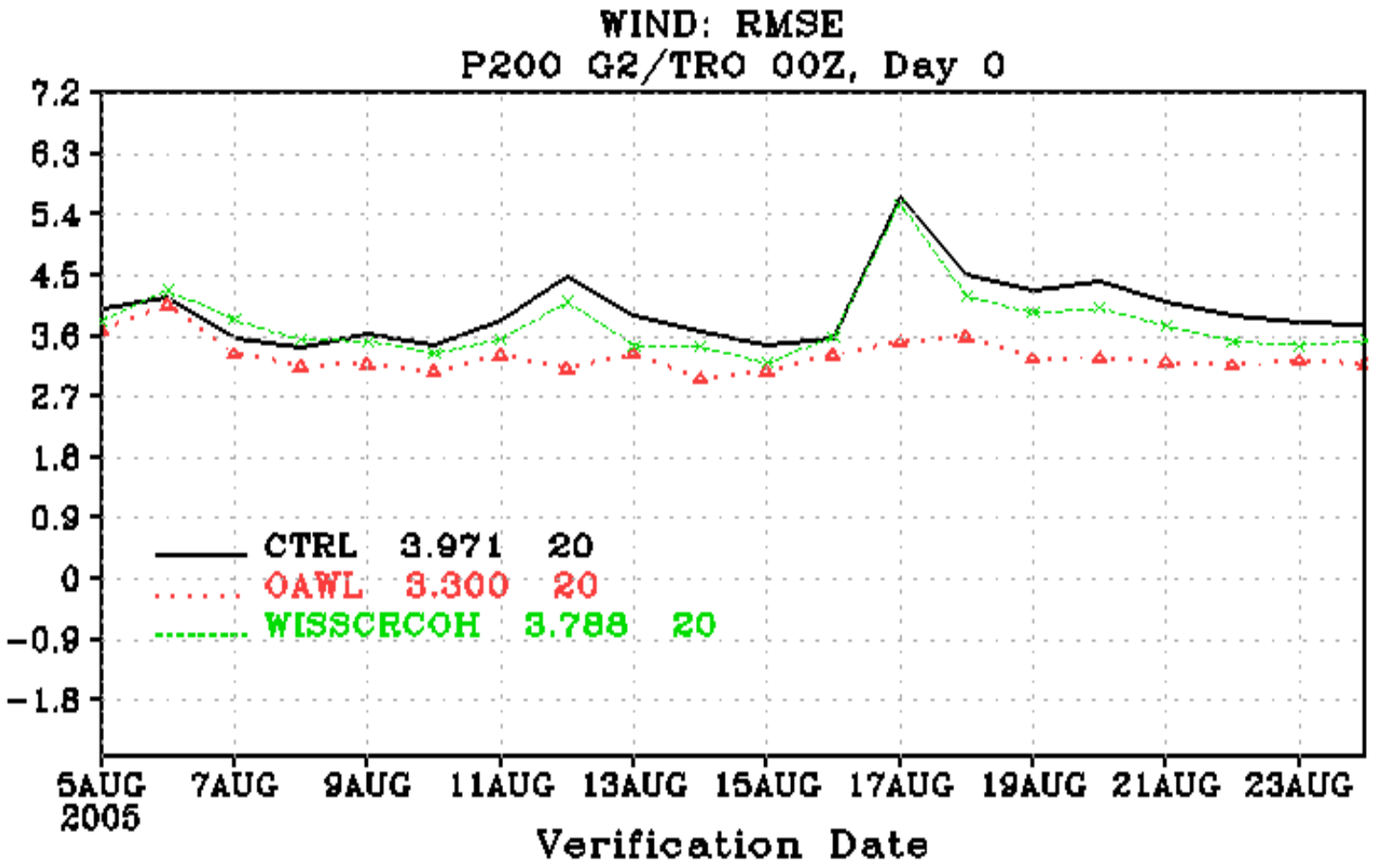
CTRL (All standard conventional and space-based data)

OAWL (CTRL+OAWL lidar wind data)

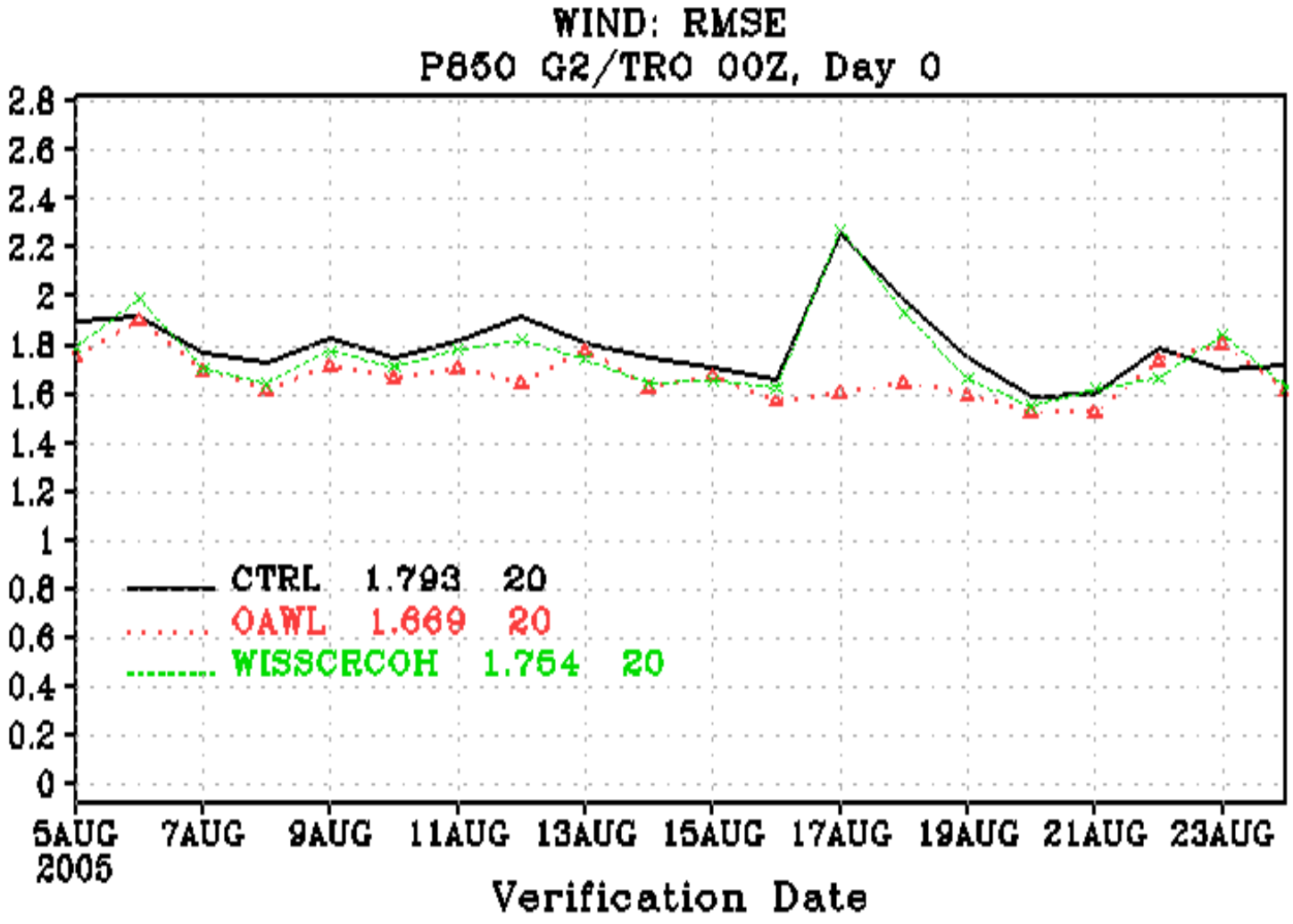
WISSCR (Conventional Data +WISCRCOH coherent lidar wind data)

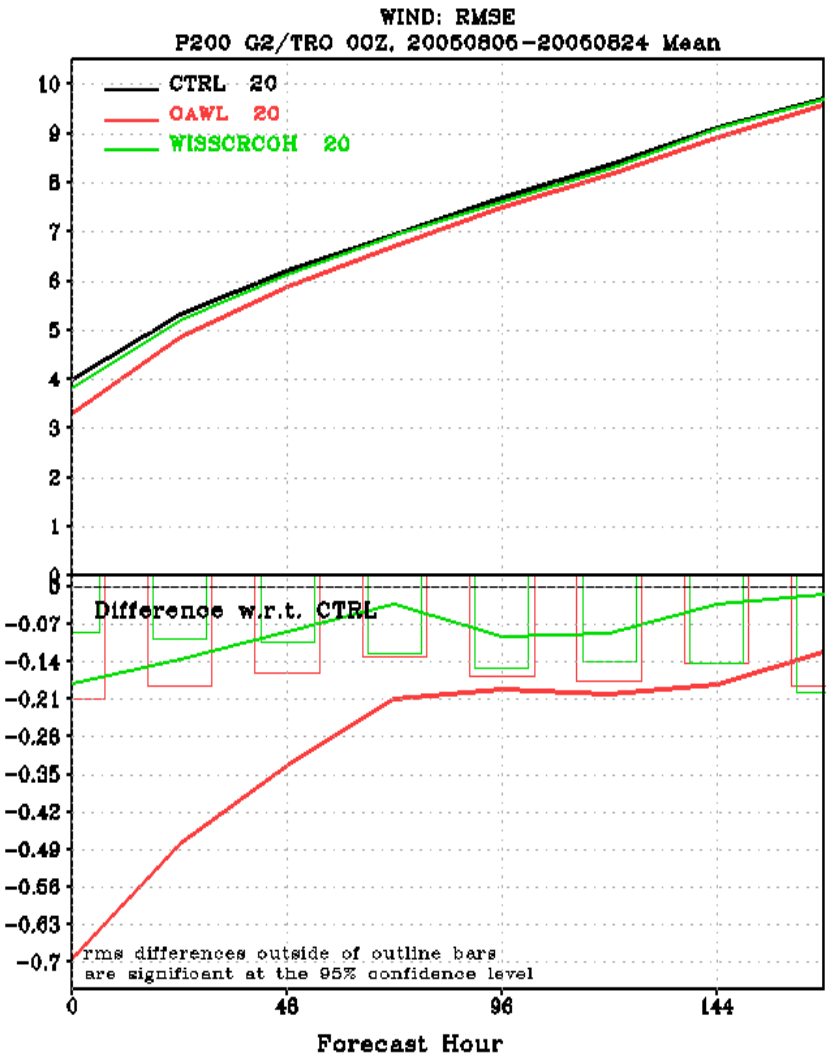
FORECAST EXPERIMENTS: Three up to 5-day forecasts generated from each

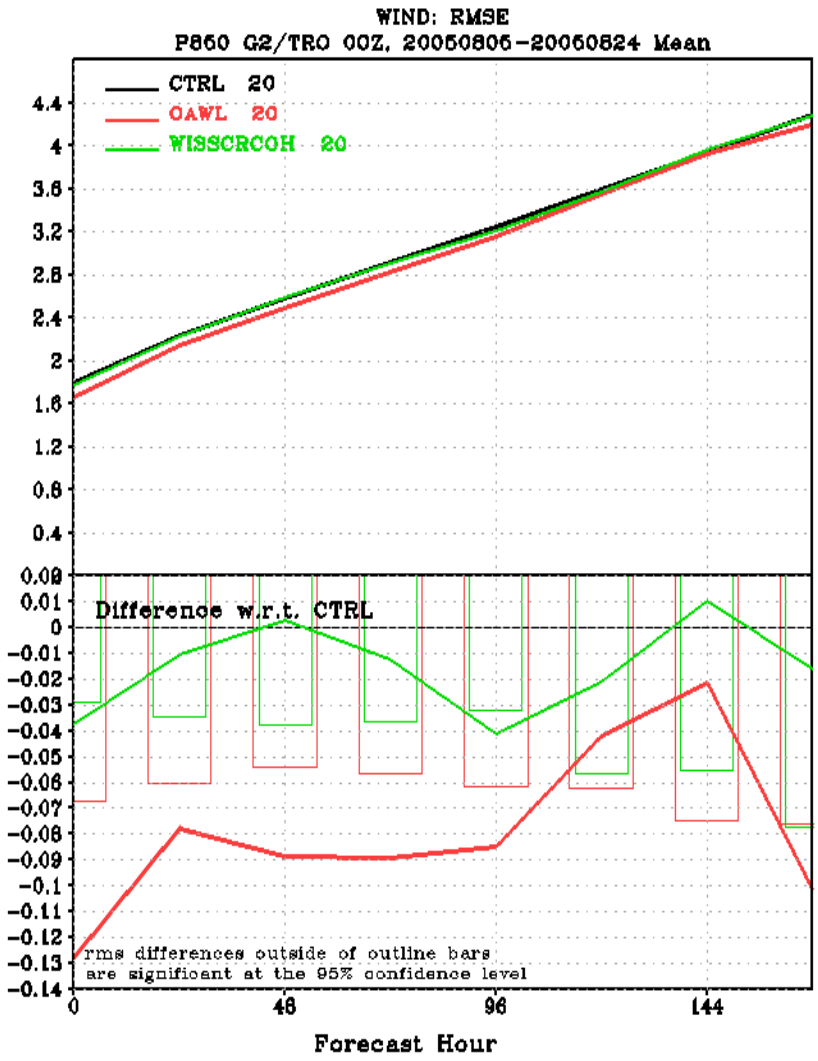
200 mb wind analysis accuracy



850 mb wind analysis accuracy

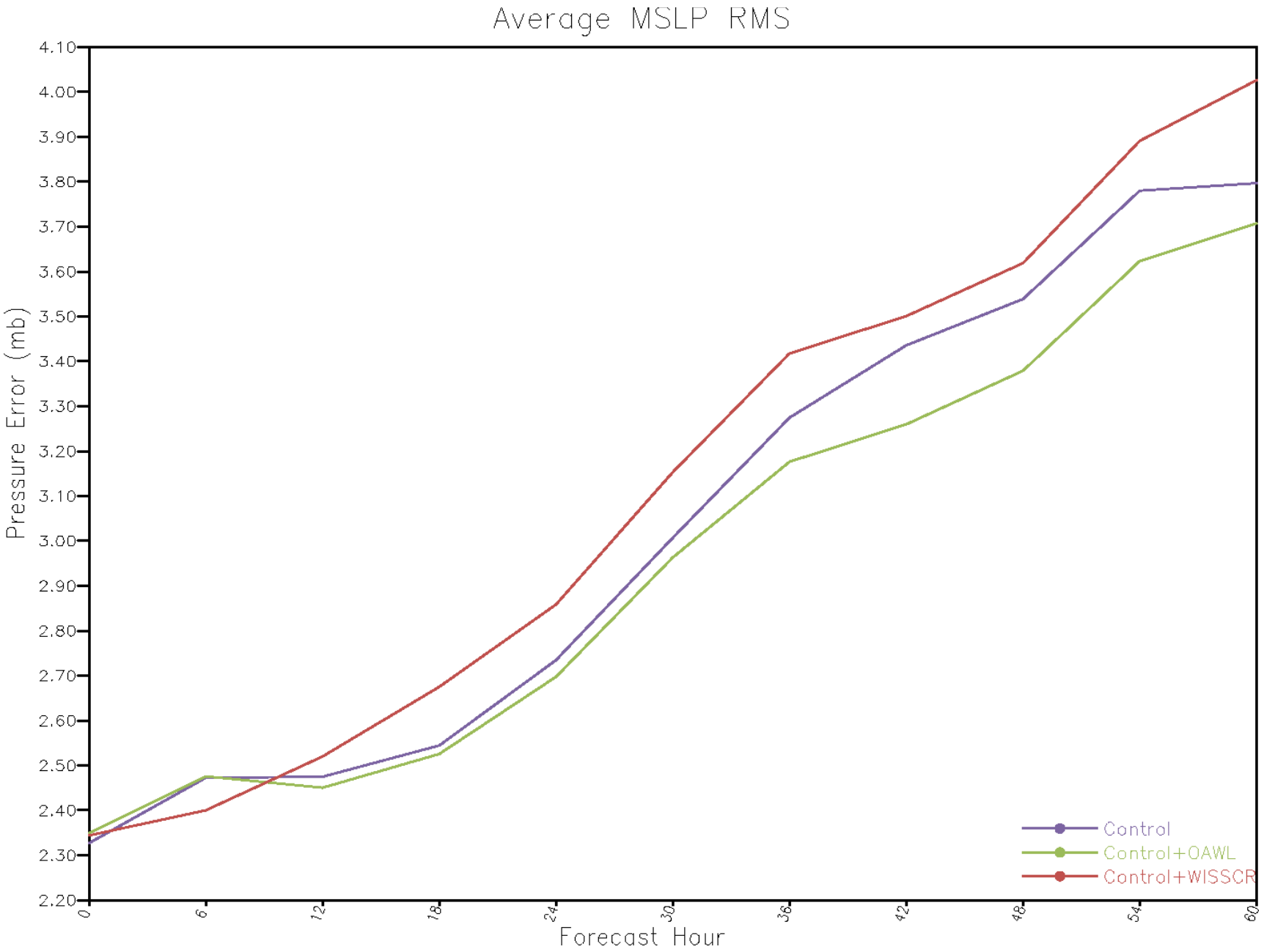


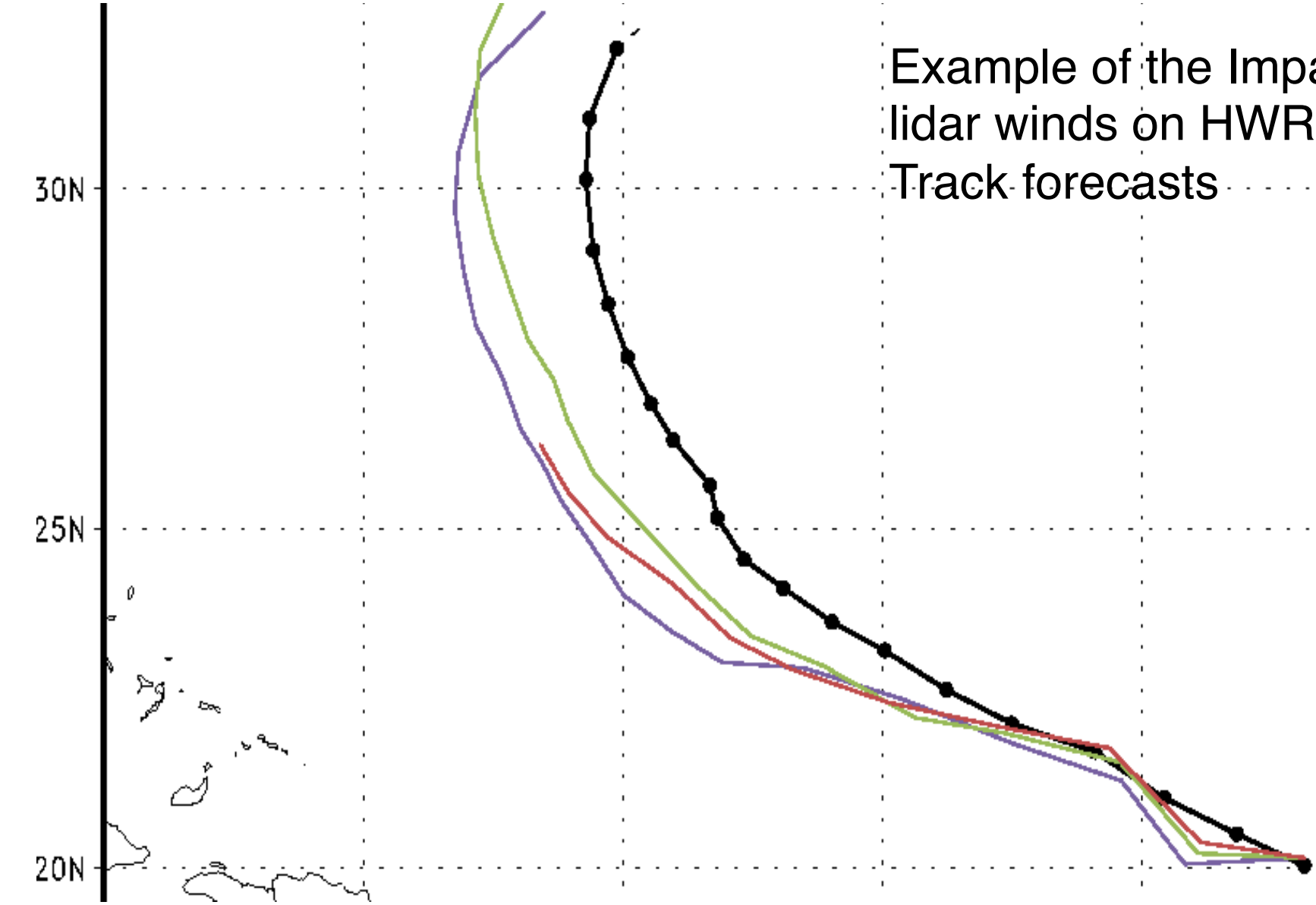




Impact on 200 mb (left) and 850mb (right) wind forecasts

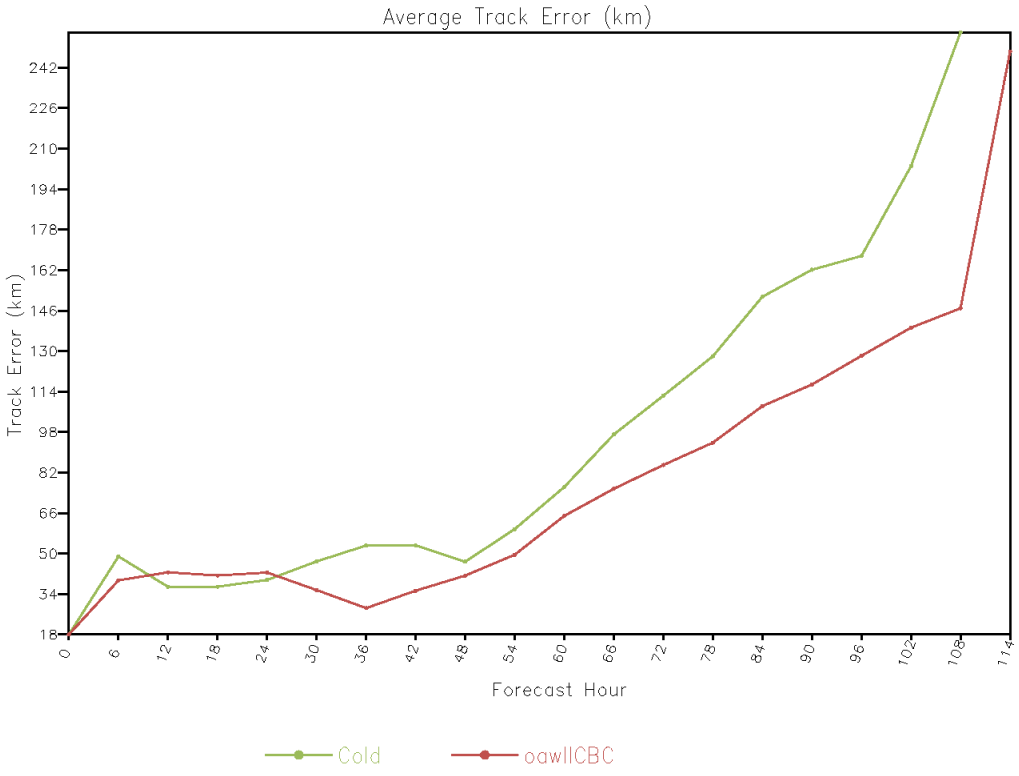
Average sea level pressure errors over HWRF forecast domain

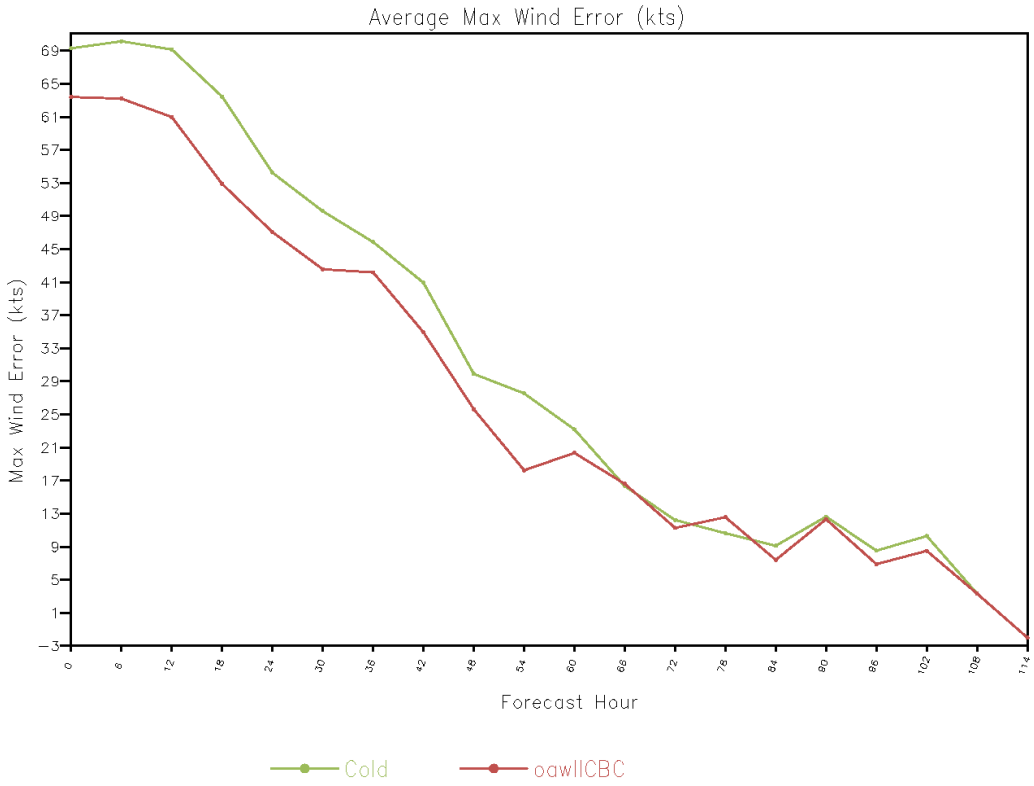




Track forecasts from August 4 06Z for Nature (black), Control (purple), Control+WISSCR_COH (red) and Control+OAWL (green).

Impact of global model assimilation of OAWL data on HWRF forecasts





Relative accuracy of HWRF forecasts resulting from global or regional assimilation of OAWL Data